Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1. (Currently Amended) A computerized method of determining when a change has occurred in an area-of-interest included in an image region of a series of video frames, the method comprising steps of:

initializing at least a portion of the image region as a background image region~~of at least a portion first frame~~;

receiving a first video frame including pixels not included in the background image region; ~~comparing a first image region from a second frame to the background image region to classify pixels as foreground pixels or background pixels;~~

classifying the pixels as foreground pixels~~based on predetermined characteristics~~; ~~and~~

based on subsequently received frames, updating the background image region to include at least one of the pixels previously classified as a foreground pixel~~that does not embody the predetermined characteristics.~~; and

in response receiving a request to identify the time at which the background image region was updated, presenting the first video frame.

2. (Original) The method of claim 1, further comprising a step of recording when the background image region was updated.

3. (Original) The method of claim 2, wherein the step of recording includes saving in a database the location of the second frame.

4. (Original) The method of claim 2, further comprising a step of searching the recorded video to determine when the background image was updated.

5. (Original) The method of claim 4, wherein the step of searching includes a step of determining whether all areas-of-interest have been processed.

6. (Currently Amended) The method of claim 4~~, wherein the step of updating the background includes incorporating the at least one pixel into the background and,~~ wherein[[,]] the step of searching includes a step of determining the number pixels that were incorporated into the background in the step of updating the background that are within the area-or-interest.

7. (Currently Amended) The method of claim 6, further comprising a step of comparing the number pixels that were incorporated into the background in the step of updating the background that are within the area-or-interest with a threshold to determine if ~~the~~ a threshold is exceed.

8. (Original) The method of claim 7, further comprising a step of returning a positive search result if the threshold is exceeded.

9. (Original) The method of claim 7, further comprising a step of backtracking to a frame where the pixels that were incorporated into the background were first classified as foreground pixels.

10. (Original) The method of claim 1, wherein the step of classifying includes a step of classifying the foreground pixels based on a static property.

11. (Original) The method of claim 10, wherein the static property is at least one of color, size, texture, or shape.

12. (Original) The method of claim 1, wherein the step of classifying includes a step of classifying the foreground pixels based on a dynamic property.

13. (Original) The method of claim 12, wherein the dynamic property is at least one of velocity, acceleration, change in size, change in area, change in color, or lack of motion.

14. (Original) The method of claim 1, wherein the step of updating the background image includes a step of incorporating the at least one foreground pixel that does not embody the

predetermined characteristics into the background image.

15. (Original) The method of claim 14, wherein the step of incorporating includes overwriting the at least one foreground pixel onto the background image.

16. (Currently Amended) A computerized method of searching video information to determine when a change has occurred in an area-of-interest comprising the steps of:

classifying ~~foreground~~ pixels within a first video frame as foreground pixels ~~into a first type and a second type~~;

incorporating the foreground pixels ~~of the first type~~ into a background image after tracking the pixels for a series of frames;

recording, as a background update occurrence, when the foreground pixels ~~of the first type~~ were incorporated into the background in a database; and

in response to a request for the background update occurrence, searching the database for background update occurrences, and backtracking to the first video frame.

17. (Original) The method claim 16, further comprising a step of classifying pixels as foreground pixels or background pixels.

RESPONSE

Claims Status

Claims 1 – 17 were originally filed in this application. An office action issued on January 31, 2007, rejecting claims 1 – 17. In this response, Applicants have amended independent claims 1 and 16 as well as dependent claims 6 and 7. Support for the amendments can be found throughout the originally filed specification and claims, and, for example, at paragraphs [0050] – [0055] of the application as published. No new matter has been added.

Claim Rejections

In the current office action, claim 15 was rejected under 35 U.S.C. §112, first paragraph as failing to comply with the enablement requirement.

Further, claims 1 – 17 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent Publication No. 2004/0001612 to Gutta, et al. ("Gutta"). Claims 1 – 16 were also rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 7,023,469 to Olson ("Olson").

Applicants respectfully submit that the claims as amended are patentable over the cited references.

Rejection under 35 U.S.C. §112

Applicants respectfully draw the Examiner's attention to paragraph [0051] of the application as published for one possible description of how foreground pixels can be overwritten onto a background image. Applicants suggest this text sufficiently enables claim 15 such that one skilled in the art would be able to practice the invention without undue experimenttion.

Rejections Under 35 U.S.C. §102

Independent claim 1, as amended, recites initializing an image region within a video stream as a background image region, classifying pixels not included in the background image as foreground, and after receiving some number of subsequent frames, reclassifying foreground pixels as background pixels. Independent claim 16 recites receiving a request to identify the time at which the background image was updated and, in response, presenting the video frame in which the object first appeared. As a result, the claimed technique presents users with a video that shows when an object first appeared, as opposed to when the system determined that the object should be reclassified as part of the background. See, for example, paragraphs [0050] – [0055] of the application as published.

Generally, Gutta describes a set of algorithms for background-foreground segmentation within video data in order to maintain a background model. (Gutta, para. [0013].) The Gutta approach consists of two processes, a training process used to generate the background model and a segmentation process that uses the background model during normal operation of a video processing system. (Gutta, para. [0017].) Specifically, the described technique "defines and refines probability tables" for each pixel and uses a conventional Guassian approach to calculate the probabilities. (Gutta, para. [0020].) These probabilities are then compared to thresholds to determine if a pixel should be classified as background or foreground. (Gutta, para. [0021].)

Olson uses similar techniques to identify and track "change regions" in images. (Olson, Abstract.) Although Olson contemplates scenarios in which changes in the background may occur, his approach to updating the background is typical of the prior art. Specifically, newly identified objects are tracked for some period of time (e.g., 20 seconds), and if no movement of the object is detected it is incorporated into a new reference image. (Olson, col. 7, line 57 – col. 8, line 13.)

In contrast, Applicants' claims recite not only updating a background image with pixels previously classified as foreground, but providing users with the first frame in which the change that precipitated the update appeared – not merely when the background was updated. Such an approach is clearly distinct from the conventional techniques described by Gutta and Olson in which a reference image is periodically updated for subsequent analysis. Although users may be interested in when new backgrounds or reference images are defined by a video system, such occurrences say nothing about when a change first took place. It is this transition (e.g., the removal of an item from shelf or the placement of a fixture in an aisle way) that is of interest to users of the present invention. For example, Applicants' invention allows users to search for and review events of interest from the point at which the events first begin in the video, not when the system determines such events should be classified as foreground or background.